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PATENT ABSTRACTS OF JAPAN

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(71)Applicant : OKI ELECTRIC IND CO LTD

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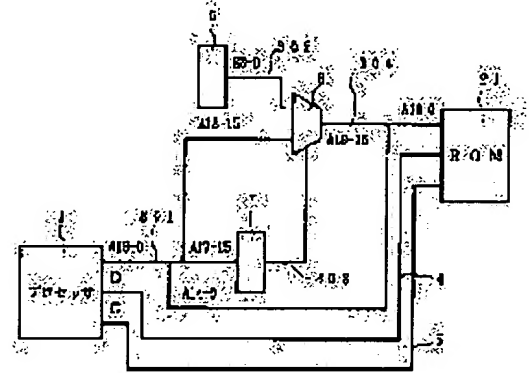
(72)Inventor : ONO MASAYOSHI

(54) FIRMWARE CONTROL SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To easily deal with the change of a device, which is to be controlled by a firmware, at the time of changing the device.

SOLUTION: A ROM 21 stores plural graphic firmwares. A select value for selecting any firmware corresponding to a graphic device to be connected is inputted to a select value input means 6. When a processor 1 performs access to an area allocated to the graphic firmware inside a memory address space, an address corresponding to the select value inputted by the select value input means 6 is generated by a decoder 7 and a selector 8 and the desired graphic firmware is called from the ROM 21.



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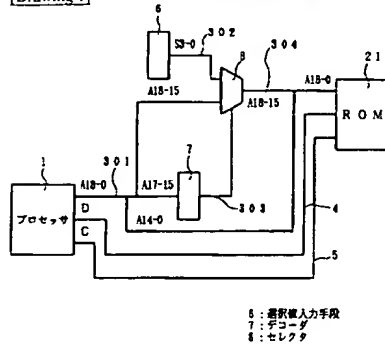
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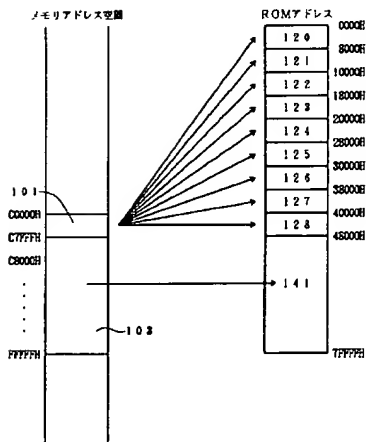
DRAWINGS

[Drawing 1]



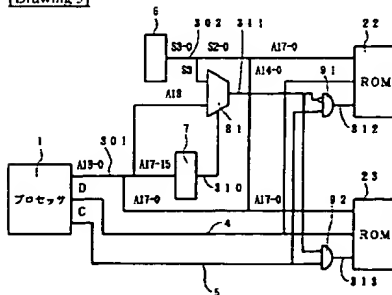
本発明のファームウェア制御方式の第1の実施の形態を示すブロック図

[Drawing 2]



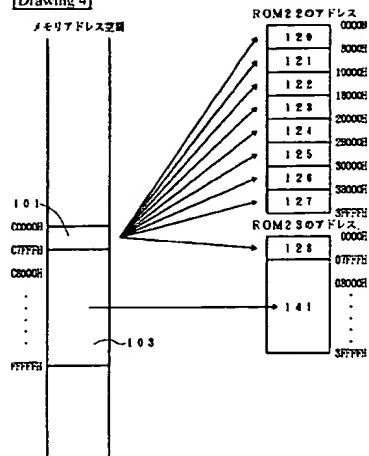
メモリアドレス空間とROMの関係を示す説明図

[Drawing 3]



ファームウェア制御方式の第2の実施の形態を示すブロック図

[Drawing 4]

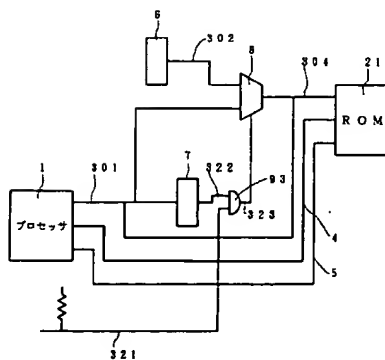


メモリアドレス空間とROMの関係を示す説明図

[Drawing 5]

3 of 4

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ファームウェア制御方式の第Ⅱの実施の形態を示すブロック図

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram showing the gestalt of operation of the 1st of the firmware control system of this invention

[Drawing 2] Explanatory drawing showing the relation between memory address space and ROM

[Drawing 3] The block diagram showing the gestalt of operation of the 2nd of the firmware control system of this invention

[Drawing 4] Explanatory drawing showing the relation between memory address space and ROM

[Drawing 5] The block diagram showing the gestalt of operation of the 3rd of the firmware control system of this invention

[Description of Notations]

1 Processor

6 Selection Markup Force Means

7 Decoder

8 Selector

21 ROM

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the control system of the firmware in an information processor.

[0002]

[Description of the Prior Art] In an information processor, especially the equipment of PCAT specification, since it is decided that it stores in the specific address space of memory, the firmware to devices, such as a display, has stored in ROM only the firmware corresponding to the display which it is going to connect.

[0003] Moreover, since such a firmware is based on the supply which it controls from a display controller's maker, except for a parameter, the thing in which the customize by the side of a user is impossible is common [a firmware] in part. Furthermore, since this firmware is stored in ROM and included in equipment, it needs exchange of components to perform correspondence to a different display.

[0004]

[Problem(s) to be Solved by the Invention] When it is going to offer a connectable information processor for two or more sorts of displays on which parameters etc. differ easily, ROM which stored the firmware corresponding to each display is prepared, and ROM which is adapted at the time of display connection must be selected and remounted.

[0005] Moreover, although there is also a method of preparing rewritable ROM and rewriting on equipment at the time of employment, if the firmware of a display is changed on the way, an indication will not be given to the display on which an indication was given till then at the time, and the display of a modification end message etc. cannot be performed, but it is possible [it] to cause trouble to an activity. The technical problem that it corresponds more easily and cheaply occurs to these technical problems.

[0006] Moreover, in a great portion of equipment, in order to use only a general-purpose display, the existing ROM is used as much as possible, and the technical problem which can be made to carry out cost reduction occurs by carrying out as [be / only required equipment / extensible]. Furthermore, if the display breaks down in the condition that it can respond to two or more sorts of special displays while using a special display, in order to prevent that employment stops since substitution cannot come to hand and use of equipment cannot be performed, the technical problem that a general-purpose display is made to make connection possible easily occurs.

[0007]

[Means for Solving the Problem] In order to solve a technical problem mentioned above, this invention reads a firmware for controlling a device with a processor from a storage means, and stores it in a predetermined address space of memory. In a firmware control system which makes a desired device controllable While storing in said storage means two or more application firmwares for controlling different application devices from a basic firmware which controls a certain basic device, and this basic device A selection markup force means by which a selection value for choosing a desired firmware according to a device connected out of said storage means is inputted, It has a selection means to select the address from a processor, and the address of a selection value from said selection markup force means. Said selection means If a processor specifies the address of a specific address space currently assigned to a basic device, based on a selection value from said selection markup force means, the one address in a basic firmware or an application firmware will be generated.

[0008]

[Embodiment of the Invention] Drawing 1 is the block diagram showing the gestalt of operation of the 1st of the firmware control system of this invention. In drawing, it is ROM in which 1 stores a processor in and 21 stores a firmware. Here, capacity of this ROM21 is set to 512KB.

[0009] It is a control signal, as for 4, for a processor 1 to control the data signal from ROM21 to a processor 1, and for 5 control ROM21. 6 is a selection markup force means and the selection value which chooses the firmware corresponding to the graphic device connected out of two or more sorts of graphic firmwares stored in said ROM21 is stored. In addition, let a selection value be 4-bit information here.

[0010] This selection markup force means 6 is a short plug, is a register, is a signal from the outside, or is ROM. 302 is the output signal of the selection markup force means 6. 7 is a decoder, decodes a graphic firmware field among address spaces using the address signal 301 from a processor 1, and notifies it with a signal 303.

[0011] 8 is a selector and selects the address signal 302 from the selection markup force means 6, and the address signal 301 from a processor 1 with the signal 303 from a decoder 7. 304 is an output signal from a selector 8, is in a part of this output signal 304 and address signal 301 from a processor 1, and is connected to ROM21 as the address.

[0012] Drawing 2 is explanatory drawing showing the relation between memory address space and ROM. In the address space of the

memory which is not illustrated, address space C0000H to FFFFFH corresponds from address 00000H of ROM21 to 7FFFFH(s). 101 is the field currently assigned to the graphic firmware in memory address space, and is 32KB of one space of C0000H to C7FFFH. [0013] 103 is the field assigned to other firmwares in memory address space, and is the space of C8000H to FFFFFH. 120-128 are nine graphic firmwares stored in ROM21, for example, from ROM-address 00000H, to the field of 07FFFH(s), the graphic firmware 121 is stored in the field of 0FFFFH from 08000H, and the graphic firmware 128 is stored in the field of 40000H to 47FFFH(s) for the graphic firmware 120.

[0014] 141 is the field where firmwares other than a graphic are stored in ROM21, and the field of 7FFFFH(s) is assigned from 48000H. Below, actuation of the gestalt of the 1st operation is explained. When the memory address space which is not the firmware of a graphic is accessed, since the address signal 301 from a processor 1 is not decoded by the decoder 7, a selector 8 selects an address signal 301 and is notified to ROM21.

[0015] For example, when address C8000H are accessed, 48000H of 19 bits of the low order are notified to ROM21, and the address of ROM is accessed. When graphic firmware space is accessed, the address signal 301 from a processor 1 is decoded by the decoder 7, and by the signal 303, the address signal 302 by the side of the selection markup force means 6 is selected by the selector 8, and it is notified to ROM21 with 15 bits of low order of the address signal 301 from a processor.

[0016] For example, if address C0000H are accessed when 0H are set up as a selection value with the selection markup force means 6 Selectors 8-0H (4 bits) are outputted, and this serves as 4 bits of high orders of the address of ROM21, and is set to 00000H with 15 bits of low order of the address signal 301 from a processor 1. The address of the head of the graphic firmware 120 currently assigned to the field of 7FFFH(s) from 0000H in ROM21 will be accessed.

[0017] Moreover, when 1H are set as the selection markup force means 6 as a selection value, 08000H will be notified to ROM21 and the address of the head of the graphic firmware 121 currently assigned to the field of 0FFFFH from 8000H in ROM21 will be accessed. Thus, if the field of the graphic firmware of memory address space is accessed, according to the selection value set as the selection markup force means 6, one of the graphic firmwares on ROM21 will be chosen, and the field will be accessed. It can be used by making it change according to the graphic device to which a selection value is connected, without choosing the graphic firmware corresponding to the connected graphic device, coming, and a processor side being conscious of a corresponding firmware.

[0018] In addition, in other firmware fields 141 of ROM21, when there is a free area, it is possible to be able to use as a graphic firmware field, since this free area can also be chosen according to a selection value, and to increase alternative. As explained above, with the gestalt of operation of the 1st of this invention A processor only accesses the field of the graphic firmware of memory address space as usual. It is possible to call one of the requests out of two or more graphic firmwares according to a selection value. Since it is not necessary to change a program specially in order to call a desired graphic firmware out of two or more graphic firmwares, the graphic firmware corresponding to the connected graphic device can be used without a processor side being conscious.

[0019] Moreover, alternative can be fluctuated according to the capacity of ROM, and it can constitute so that it may become the optimal in cost. Furthermore, at the time of modification of a graphic device, in order to exchange ROMs, it is not necessary to disassemble equipment, and it can respond to it easily only by changing a selection value. Moreover, PCAT specification or the specification of an information processor is not affected.

[0020] Furthermore, the addition of a graphic firmware is possible, without making most mounting fields of ROM increase. Moreover, since a graphic firmware can be changed at high speed, a display can be smoothly changed at the time of a graphic device change.

Drawing 3 is the block diagram showing the gestalt of operation of the 2nd of the firmware control system of this invention.

[0021] In drawing, they are a processor and ROM in which 1 stores 22 in and 23 store a firmware. Here, the basic graphic firmware of the basic graphic device which will usually be used is stored in ROM23 with firmwares other than a graphic, and the application graphic firmware of other application graphic devices is stored in ROM22.

[0022] It is a control signal, as for 4, for a processor 1 to control the data signal from ROM22 and ROM23 to a processor 1, and for 5 control ROM22 and ROM23. 6 is a selection markup force means and the selection value which chooses the graphic firmware corresponding to the graphic device connected out of two or more sorts of graphic firmwares stored in said ROMs 22 and 23 is stored. In addition, let a selection value be 4-bit information here.

[0023] This selection markup force means 6 is a short plug, is a register, is a signal from the outside, or is ROM. 302 is the output signal of the selection markup force means 6. 7 is a decoder, decodes a graphic firmware field among address spaces using the address signal 301 from a processor 1, and notifies it with a signal 310.

[0024] 81 is a selector and chooses the address signal 302 from the selection markup force means 6, and the address signal 301 from a processor 1 with the signal 310 from a decoder 7. A signal 311 is a signal chosen by this selector 81. 91 is the AND gate of the negative logic of the output signal 311 of said selector 81, and the control signal 5 from a processor 1, and controls ROM22 by the output signal 312 which is the result of taking an AND.

[0025] 92 is the AND gate of the positive logic of a signal 311, and a control signal 5, and controls ROM23 by the output signal 313 of the result. Drawing 4 is explanatory drawing showing the relation between memory address space and ROM. Here, in memory address space, FFFFFH is assigned to ROM22 and ROM23 from address space C0000H.

[0026] 101 is the field currently assigned to the graphic firmware in memory address space, and is 32KB of one space of C0000H to C7FFFH. 103 is the field assigned to other firmwares in memory address space, and is the space of C8000H to FFFFFH. 120-127 are eight graphic firmwares stored in ROM22, for example, to the field of address 00000H to 07FFFH(s) of ROM22, the graphic firmware 121 is stored in the field of 0FFFFH from 08000H, and the graphic firmware 127 is stored in the field of 38000H to 3FFFFH(s) for the graphic firmware 120.

[0027] 128 is the graphic firmware stored in ROM23, and the field of 07FFFH(s) is assigned from 00000H. 141 is the field where firmwares other than a graphic are stored in ROM23, and the field of 3FFFFH(s) is assigned from 08000H. Below, actuation of the gestalt of the 2nd operation is explained.

[0028] When the memory address space which is not the firmware of a graphic, for example, C8000H to FFFFFH, is accessed, since

all address bits 17-15 are not 0, the address signal 301 from a processor 1 is not decoded by the decoder 7. For this reason, a selector 81 selects the address bit 18 of an address signal 301, and is notified to the gates 91 and 92 as a signal 311.

[0029] Here, since the address bit 18 of an address signal 301 is a logical value 1 at the time of ROM space, it passes through the gate 92 and is notified to ROM23. For example, when address C8000H are accessed, to ROM23, 08000H of 18 bits of the low order are notified, and the address of the head of a field 141 is accessed the correspondence address in this ROM23, and here.

[0030] When C0000H to C7FFFH is accessed, since the address bits 17-15 are 0 altogether, the address signal 301 from a processor 1 is decoded by the decoder 7 the memory address space of a graphic, and here. For this reason, the signal 302 by the side of the selection markup force means 6 is selected by the signal 310 from a decoder 7, and a selector 81 is notified to the gates 91 and 92 as a signal 311.

[0031] Here, since a logical value is 0, the most significant bit from the selection markup force means 6 passes through the gate 91, and controls ROM22. Thereby, the address of ROM22 is carried out by 15 bits of low order of the address signal 301 from a processor 1, and the signal of the triplet from the selection markup force means 6. For example, when the selection value is set up with 0H with the selection markup force means 6 and address C0000H are accessed, Selectors 81-0H (triplet) are outputted, and this serves as a high order triplet of the address of ROM22, is set to 00000H with 15 bits of low order of the address from a processor 1, and will access the head of the field 120 of ROM22. When the selection value is set up with 1H with the selection markup force means 6, 08000H will be notified to ROM22 and the head of the field 121 of this ROM22 will be accessed.

[0032] In addition, when accessing the graphic firmware field 128 by the side of ROM23, since a logical value is set to 1 by the signal 302 selected by the selector 81 by setting up the set point with 8H in the set point input means 6, ROM23 is controlled and it can access. Thus, if the field of the graphic firmware of memory address space is accessed, according to the selection value set as the selection markup force means 6, one of the graphic firmwares on ROM22 or ROM23 will be chosen, and the field will be accessed. It can be used by making it change according to the graphic device to which a selection value is connected, without choosing the graphic firmware corresponding to the connected graphic device, coming, and a processor side being conscious of a corresponding firmware.

[0033] In addition, in other firmware fields of ROM23, when there is a free area, it is possible to be able to use as a graphic firmware field, since this free area can also be chosen according to the set point, and to increase alternative. As explained above, since it is not necessary to change the program for calling a firmware in a processor specially, with the gestalt of operation of the 2nd of this invention, the graphic firmware corresponding to the connected device can be used, without a processor side being conscious.

[0034] Moreover, the conventional ROM is used as it is, and since what is necessary is to add ROM which stored the graphic firmware only when a graphic side needs to be chosen, flexibility can be given in a system configuration. Furthermore, alternative can be fluctuated according to the capacity of ROM, and it can constitute so that it may become the optimal in cost.

[0035] Moreover, at the time of modification of a graphic device, in order to exchange ROMs, it is not necessary to disassemble equipment, and it can respond to it easily only by changing a selection value. Furthermore, PCAT specification or the specification of an information processor is not affected. Drawing 5 is the block diagram showing the gestalt of operation of the 3rd of the firmware control system of this invention.

[0036] In drawing, it is ROM in which 1 stores a processor in and 21 stores a firmware. Here, capacity of this ROM21 is set to 512KB. It is a control signal, as for 4, for a processor 1 to control the data signal from ROM21 to a processor 1, and for 5 control ROM21. 6 is a selection markup force means and the selection value which chooses the graphic firmware corresponding to the graphic device connected out of two or more sorts of graphic firmwares stored in said ROM21 is stored. In addition, let a selection value be 4-bit information here.

[0037] This selection markup force means 6 is a short plug, is a register, is a signal from the outside, or is ROM. 302 is the output signal of the selection markup force means 6. 7 is a decoder, decodes a graphic firmware field among address spaces using the address signal 301 from a processor 1, and notifies it with a signal 322.

[0038] 93 is the logic gate which consists of 2 input AND gates, the AND of the output signal 322 from a decoder 7 and the signal 321 from the outside is taken, and the output 323 serves as a selector signal of a selector 8. Said selector 8 selects the signal 302 from the selection markup force means 6, and the signal 301 from a processor 1 with the selector signal 323 from a logic gate 92.

[0039] 304 is an output signal from a selector 8, is in a part of this output signal 304 and signal 301 from a processor 1, and is connected to ROM21 as the address. Below, actuation of the gestalt of the 3rd operation is explained. In addition, in explaining actuation of the gestalt of the 3rd operation, since the relation between memory address space and ROM is the same as what was explained by drawing 2, drawing 2 is referred to in the gestalt of this 3rd operation.

[0040] Since the address signal 301 from a processor is not decoded by the decoder 7 but the output of a logic gate 93 serves as a logical value 0 when the signal 321 from the outside is a logical value 1 and the memory address space which is not the firmware of a graphic is accessed, a selector 8 selects an address signal 301 and is notified to ROM.

[0041] For example, when memory address C8000H are accessed, 48000H of 19 bits of the low order are notified to ROM21, and the address of ROM21 is accessed. Since the address signal 301 from a processor is decoded by the decoder 7 and the output of a logic gate 93 also serves as a logical value 1 when the signal 321 from the outside is a logical value 1, and the firmware space of a graphic is accessed, by the selector signal 322, the signal 302 by the side of the selection markup force means 6 is selected by the selector 8, and it is notified to ROM21 with 15 bits of low order of the address signal 301 from a processor.

[0042] For example, if memory address C0000H are accessed when 0H are set up with the selection markup force means 6 Selectors 8-0H (4 bits) are outputted, and this serves as 4 bits of high orders of the address of ROM21, and is set to 00000H with 15 bits of low order of the address from a processor 1. The address of the head of the graphic firmware 120 currently assigned to the field of 0000H to 8000H in ROM21 will be accessed.

[0043] Thus, when the signal 321 from the outside is a logical value 1 and the firmware space of a graphic is accessed, according to the selection value set as the selection markup force means 6, one of the graphic firmwares on ROM21 is chosen, and the field is accessed. Thus, it can be used by the graphic firmware corresponding to the connected graphic device being chosen, without a processor side

being conscious of a corresponding firmware.

[0044] Since the address signal 301 from a processor 1 is not decoded by the decoder 7 but the output of a logic gate 93 also serves as a logical value 0 when the signal 321 from the outside is a logical value 0 and the memory address space which is not the firmware of a graphic is accessed, a selector 8 selects an address signal 301 and is notified to ROM21.

[0045] For example, when memory address C8000H are accessed, 48000H of 19 bits of the low order are notified to ROM21, and the address of ROM21 is accessed. When the signal 321 from the outside is a logical value 0 and the firmware space of a graphic is accessed, although the address signal 301 from a processor is decoded by the decoder 7, since the gate is carried out in a logic gate 93, the output serves as a logical value 0, a selector 8 selects an address signal 301 and the address from a processor 1 is notified to ROM21 as it is.

[0046] For this reason, access to C7FFFH which are the memory address space currently assigned to the graphic firmware from C0000H turns into access to the field 128 which is 47FFFH(s) from 40000H of ROM21 in 19 bits of that low order. Here, by what this field is made into the field of the basic graphic firmware from the former for, when the signal 321 from the outside is a logical value 0 and the memory address space currently assigned to the graphic firmware is accessed, regardless of the selection value set as the selection markup force means 6, the basic graphic firmware on ROM21 is chosen, and that field is accessed.

[0047] Thus, with the gestalt of the 3rd operation, the mode which can choose a graphic firmware with the signal from the outside according to a selection value, and the mode accessed only to the field covered by ROM from the former can be chosen. By this mounting the general-purpose graphic firmware in a certain graphic firmware field from the former of ROM, and setting up the logical value of the signal from the outside with 0 Suppose that it is accessible only to a certain field from the former of ROM, or the logical value of the signal from the outside is set up with 1. It considers as the environment which can use a special graphic device, and when a special graphic device breaks down, a general-purpose graphic device can be easily connected by changing the logical value of the signal from the outside to 0.

[0048] In addition, it is also possible by changing a logic gate 93 to change the polarity of the signal from the outside. The gestalt of this 3rd operation here is applicable also to the 2nd configuration of the gestalt of operation. By namely, the thing for which an AND is taken for the output signal 310 of a decoder 7, and the signal from the outside in a logic gate, and the output is made into the selector signal of a selector 81 in drawing 3 When the logical value of the signal of the exteriors is 1 and the memory address space currently assigned to the graphic firmware is accessed According to the selection value set as the selection markup force means 6, one in the graphic firmware on ROM22 is chosen. When the logical value of the signal of the exteriors is 0 and the memory ADOSU space of a graphic firmware field is accessed, it is not based on the selection value set as the selection markup force means 6, but the graphic firmware on ROM23 can be chosen.

[0049] As explained above, since it is not necessary to change the program for calling a firmware in a processor specially, with the gestalt of operation of the 3rd of this invention, the graphic firmware corresponding to the connected device can be used, without a processor side being conscious. Moreover, alternative can be fluctuated according to the capacity of ROM, and it can constitute so that it may become the optimal in cost.

[0050] Furthermore, at the time of modification of a graphic device, in order to exchange ROMs, it is not necessary to disassemble equipment, and it can respond to it easily only by changing a selection value. Moreover, PCAT specification or the specification of an information processor is not affected. Furthermore, the addition of a graphic firmware is possible, without making most mounting fields of ROM increase.

[0051] Moreover, since access of a certain firmware field can be changed from the former to the firmware field extended by the change of an external signal, if the firmware of a general-purpose graphic device is assigned to a certain firmware field from the former, a selection value cannot be changed but ** can also change easily connection of a general-purpose graphic device and connection of a special graphic device.

[0052] In addition, although the example applied to the graphic firmware with the gestalt of the 3rd operation was explained from the 1st mentioned above, it is applicable also to other firmware portions, for example, SCSI firmware etc., etc. by changing the decoder section and the selector section. Moreover, [0053] which can extend the number and the selector section of a selection value which are stored with a selection markup force means, and can extend the number of the firmwares which can be chosen to arbitration by expanding the address width of face to ROM although the firmware field extended in the gestalt of each operation is set to 256kByte(s)

[Effect of the Invention] If this invention accesses the memory address space currently assigned to the firmware of a certain device as explained above Since one of the firmwares on ROM was chosen according to the selection value set up according to the device connected A processor only accesses the field to which memory address space was decided as usual. Since it is not necessary to change a program specially in order it is possible to call one of the requests out of two or more firmwares according to the device connected and to call a desired firmware out of two or more firmwares The firmware corresponding to the connected device can be used without a processor side being conscious.

[0054] Moreover, since the change in alternative can respond by modification of a selection value, it can fluctuate alternative easily according to the capacity of ROM, and it can constitute it so that the existing ROM may be utilized and it may become the optimal in cost. Furthermore, at the time of modification of a device, in order to exchange ROMs, it is not necessary to disassemble equipment, and according to a device, it can respond to it easily only by changing a selection value.

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CLAIMS

[Claim(s)]

[Claim 1] In a firmware control system which reads a firmware for controlling a device with a processor from a storage means, stores in a predetermined address space of memory, and makes a desired device controllable While storing in said storage means two or more application firmwares for controlling different application devices from a basic firmware which controls a certain basic device, and this basic device A selection markup force means by which a selection value for choosing a desired firmware according to a device connected out of said storage means is inputted, It has a selection means to select the address from a processor, and the address of a selection value from said selection markup force means. Said selection means A firmware control system which will be characterized by generating the one address in a basic firmware or an application firmware based on a selection value from said selection markup force means if a processor specifies the address of a specific address space currently assigned to a basic device.

[Claim 2] It is the firmware control system characterized by making a storage means by which said storage means stores a basic firmware in a firmware control system according to claim 1, and a storage means to store an application firmware become independent.

[Claim 3] A firmware control system characterized by having a change means for it not to be based on a selection value, to make the address of a basic firmware generate, or to make the address according to a selection value generate in a firmware control system according to claim 1 or 2 when a processor specifies the address of a specific address space.

[Translation done.]